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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,789	03/26/2004	Wei Gao	SLA0837	5215

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EXAMINER

ARANCIBIA, MAUREEN GRAMAGLIA

ART UNIT PAPER NUMBER

1763

DATE MAILED: 03/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/813,789

Applicant(s)

GAO ET AL.

Examiner

Maureen G. Arancibia

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f):
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 03/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because it appears that the top layer in Figure 16 should be labeled with reference character "15" to indicate the second transparent layer. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-3, 5, 6, 11, 12, 14, 16, 17, and 20 are rejected under 35

U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication

2005/0103745 to Li.

In regards to Claim 1, Li teaches a method of forming a microlens structure comprising: a) providing a transparent material 10; b) forming a hard mask 12 overlying the transparent material; c) patterning an opening in the hard mask; and d) forming a lens shape 18 by etching the hard mask and the transparent material using an isotropic wet etch, whereby the hard mask is etched laterally to expose a larger area of the underlying transparent layer as the etch proceeds. (Figures 6A-6C; Paragraphs 15-18 and 22)

In regards to Claim 2, Li further teaches filling the lens shape with a lens material 20. (Figure 6D; Paragraph 24)

In regards to Claim 3, the transparent material 10 can be silicon oxide. (Paragraph 23)

In regards to Claim 5, the isotropic wet etch can be a buffered HF etch. (Paragraph 23)

In regards to Claim 6, the lens material 20 has a higher refractive index than the transparent material 10. (Paragraph 24)

In regards to Claims 11 and 12, Li teaches planarizing the lens material by chemical mechanical polishing. (Paragraph 25)

In regards to Claim 14, the isotropic wet etch etches the hard mask 12 faster than the transparent material 10. (Paragraph 22)

In regards to Claim 16, the hard mask 12 can be a doped silicon oxide (*phosphosilicate glass*) and substrate 10 can be undoped silicon oxide (*HDP CVD Oxide*). (Paragraph 23)

In regards to Claim 17, the opening in the hard mask 12 can have non-vertical walls. (Figure 9C; Paragraph 22)

In regards to Claim 20, the transparent layer can be provided overlying a substrate having a photodetector formed thereon. (Paragraphs 2 and 3)

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li in view of U.S. Patent Application Publication 2004/0082094 to Yamamoto.**

The teachings of Li were discussed above. Li further teaches that the hard mask 12 can be TEOS oxide and the transparent material 10 can be silicon oxide. (Paragraph 27)

In regards to Claim 15, Li does not expressly teach that the transparent material can be thermal oxide.

Yamamoto teaches that a transparent material 305 located below microlenses 313 can be thermal oxide. (Paragraph 23)

It would have been obvious to one of ordinary skill in the art to modify the teachings of Li to form the transparent material of thermal oxide, as taught by Yamamoto. The motivation for doing so would have been to use from the oxide by a blanket deposition. Moreover, it has been held that the selection of a known material based on its suitability for its intended use is prima facie obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

6. Claims 1-11, 13, and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,781,762 to Ozawa in view of U.S. Patent 6,211,916 to Hawkins et al.

In regards to Claim 1, Ozawa teaches a method of forming a microlens structure comprising: a) providing a transparent material 210a; b) forming a hard mask 612 overlying the transparent material; c) patterning an opening 612a in the hard mask; and d) forming a lens shape 500 by etching the hard mask and the transparent material using an isotropic wet etch. (Figures 12a-12f; Column 14, Line 46 - Column 15, Line 65)

Ozawa does not expressly teach that the hard mask is etched laterally to expose a larger area of the underlying transparent layer as the etch proceeds.

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Hawkins et al. teaches that a hard mask 114 and the etch parameters can be selected so as to cause the hard mask to be etched laterally to expose a larger area of the underlying transparent layer 100. (Column 6, Lines 26-64)

It would have been obvious to one of ordinary skill in the art to modify the method taught by Ozawa to select the hard mask and the etch parameters to as to cause the hard mask to be etched laterally to expose a larger area of the underlying transparent layer, as taught by Hawkins et al. The motivation for making such a modification, as taught by Hawkins et al. (Column 6, Line 26 - Column 7, Line 26), would have been to allow control over the curvature of the lens shape.

In regards to Claim 2, Ozawa further teaches filling the lens shape with a lens material 230. (Figure 12f; Column 15, Line 66 - Column 16, Line 6)

In regards to Claim 3, the transparent material 210a can be silicon oxide. (*quartz*; Column 14, Lines 46-47)

In regards to Claim 4, the transparent material can also be an optical resin. (Column 3, Lines 40-41)

In regards to Claim 5, the isotropic wet etch can be an HF etch. (Column 15, Lines 4-5)

In regards to Claim 6, the lens material 230 has a higher refractive index than the transparent material 210a. (Column 16, Lines 6-10)

In regards to Claim 7, Ozawa teaches that the lens material 230 can be an optical resin (thermosetting transparent adhesive; Column 15, Line 66 - Column 16, Line 1), as broadly recited in the claim.

In regards to Claims 8-10, Ozawa teaches forming an AR coating 200 of quartz glass overlying the lens material, as broadly recited in the claim. (*cover glass 200*; Figure 12f; Column 16, Lines 1-3)

In regards to Claims 11 and 13, Ozawa teaches planarizing the lens material 230 by reflowing the lens material, as broadly recited in the claim. (the lens material is planarized when it is pressed by cover glass 200; Figure 12f; Paragraph 25)

In regards to Claim 17, the etch is isotropic, so the opening in the hard mask 114 will have non-vertical side walls.

In regards to Claims 18 and 19, Ozawa further teaches a second transparent material 220' overlying the transparent material 210a, and having a faster etch rate than the transparent material 210a. (Figure 12a; Column 14, Lines 46-50)

In regards to Claim 20, the transparent layer can be provided overlying a substrate 10 having a photodetector 9a formed thereon. (Figure 11; Column 13, Lines 59-63)

Conclusion


7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent Application Publication 2005/0019617 to Harada et al. teaches that oxides of Hf, Zn, and Zr can be used in lenses. (Paragraphs 6 and 51) U.S. Patent 6,741,394 to Tanitsu et al. teaches that an AR coating can be a resin. (Column 6, Lines 26-52) Japanese Patent Application Publication 2002-006113 to Shimizu et al. teaches a related etching method. (Figures 2a-2e)


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8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maureen G. Arancibia whose telephone number is (571) 272-1219. The examiner can normally be reached on core hours of 10-5, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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